

PLANNING AND SCHEDULING FOR SUCCESS

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Planning and scheduling should be performed according to the kind of organization and project you have at hand. Selecting the ideal planning and scheduling environment for your business may give you the competitive edge. This paper presents the reference information required for setting up the most convenient planning and scheduling (P&S) system and provides useful reference tables to assist the user decision-making at critical milestone dates. The four sections of the paper are:

1. Understanding planning and scheduling and their role in the capital projects environment.
2. Recognizing the importance of early P&S and the need to develop your project accordingly. We should realize the need to measure results, evaluate changes, train newcomers, keep historical data, control costs, establish financial constraints and constantly improve cost and time estimates.
3. Respecting human factors in the P&S development cycle, the common denominator of consolidated business success. The key roles are played by teamwork, professionalism and discipline in capital projects development.
4. Planning and scheduling development, routines, presentation and the selling of a product.

Understanding Planning and Scheduling

Some project people think of planning and scheduling as yet other management requirements to be complied with. They do not even differentiate between the two functions and consequently fail to see their value as tools for measuring results, evaluating

changes, training new employees, keeping historical data organized, controlling costs and time and establishing financial needs.

Planning is an innate human trait that allows everyone to visualize what has to be done and to proceed accordingly. This may be easy to do when the project in mind is something that does not contain more than 20 activities. Beyond that boundary, most of us will need to make a list of all the activities and possibly their sequential order to ascertain the accomplishment of all of them.

A list may not be enough when the number of activities becomes more than 100 and the necessary resources have to be accounted for. A management procedure, usually accompanied by a computer system, may be the only way to visualize the total work and to communicate it to the rest of the project team.

Table 1.
Checklist for Project Planning Basics

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| <ul style="list-style-type: none"> ● Construction equipment availability ● Work site conditions and storage place ● Construction duration and expected weather conditions ● Performance expected constraints ● Procurement market status and expected trends ● Labor availability and expected productivity ● Temporarily needed utilities ● Local bylaws, studies and interpretation |
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The primary planning objectives are concerned with getting things done within the shortest available period of time, minimizing cost and risk, and complying with the required technical specifications. Table 1 shows the basic subjects that should be addressed by project planners.

Table 2 lists the elements needed to achieve desired results.

Table 2. Planning Elements

● Objective:	Goals/target/quotas to be accomplished
● Program:	Strategy to be followed
● Budget:	Resources and expenditures organized logically
● Forecast:	Projections of what is going to happen
● Policy:	Guidance for decision-making
● Procedures:	Detailed methods for carrying out a policy
● Standard:	Accepted performance level

Scheduling is a management tool that provides time and other resource allocation to previously designed plans. Scheduling is one of the simplest and least sophisticated tools available to project management. With a good team effort at the beginning of the job and undivided support, it can be a powerful project control tool. Table 3 presents a checklist for project scheduling basic activities.

Table 3.
Checklist for Project Scheduling Basics

● Set up a work breakdown structure (WBS)
● Interface the organization breakdown structure with the WBS
● Sequentially organize project activities
● Run critical path calculations and establish project duration
● Establish a progress measuring system
● Communicate results, reviews and revisions

Unfortunately, scheduling is usually neglected by management because of the level of complexity that it typically requires.

Recognizing the Importance of Early Planning and Scheduling

P&S should start at the project conceptual stage, for obvious reasons. Some of them are discussed below.

Maintaining Solid and Consistent Cost Estimates. Enforcing P&S from project inception ensures that everyone within the organization will be aware of what is taking place. Participation becomes more effective; cost estimates are comprehensive and accurate.

Designers' communication with the rest of the team becomes a question of simply updating plans and schedules and distributing them. Cost estimators will have a clear idea of the scope of the job, regardless of how many changes take place during the development of the project.

Designers will feel comfortable knowing that cost and time estimates are faithful representations of what they are designing. Cross checking the estimators' work is made easy by following the work breakdown structure and logic sequence of events created by using P&S. The real reward comes from having a tool that keeps the project team working purposely for a common objective.

Instant Evaluation of Changes. There is nothing more distressing when working on a project than the inability to efficiently evaluate change in the project design or establish a comparison between two alternative courses of action. P&S provide effective means to know which areas of the project are bound to be affected by the decision. Total project expected impact in terms of cost and time are immediately evident. Again, all project members will be able to visualize the proposed situation and make valuable contributions.

Establishing Financial Needs. When cash flow and other financial implications for the project can be established at an early stage in the project, designers have a better chance to come up with the right ideas. The cash flow usually dictates what can be done and when. It would be silly to ignore this fact when designing and planning a project. P&S provide a clear path of expenditures through the expected project life. Management has little problem understanding the project financial needs and matching the required cash flow to the plans.

Measuring Results. Knowing where the project stands at all times is essential for productivity, cost control, future commitments, coordination and morale. Some people are scared of P&S because they think they look bad when they do not perform exactly as planned. Plans are seldom followed to the letter; they provide an excellent tool to target effort exactly as planned.

Storing Historical Data. Gathering information for future reference is an endeavor always pursued by organizations that are in the business and want to continue being part of it. P&S supplies a systematic and organized tool to keep records of project developments. Original plans and schedules and the revised ones provide the sequence of events that took owner, designer and contractor to the final product. Future project planning, scheduling, cost estimating and financing of similar projects will have a backup reference to guide their development.

Training Newcomers. Through the first stages of its life cycle, a project continually builds up labor levels. The introduction of newcomers to project scope and status could be extremely easy if P&S has been running from the beginning of the project. Original plans, propositions, changes, updates, analysis and the like will be registered on the achieved schedule revisions. Visualization of the project status is available at all times.

Human Factor Analysis

Bookstores are flooded with books describing successful business ventures and the reasons behind them. A common denominator among them is "teamwork." A project team is a group of persons with different backgrounds working for a unique objective, the successful completion of a particular project. It is essential for all members of a project to work as a team, contribute their expertise, share all information and maximize resource utilization.

Owners, designers and constructors may have different ideas about their functional goals, but when they work together as part of a project management team, they must understand their jobs as members of this unit. If the project team's objectives statement is wrong, everything that follows will be wrong, too. Starting with a clear understanding is essential.

People in project teams usually know their job descriptions, their benefits package, and their own job objectives. But their ideas about the project team's mission are frequently vague. As a group, project team members may never have articulated their objectives to one another. P&S makes everyone in the project team realize the importance of:

- Understanding their job as part of a team.
- Having a clear idea of the project objectives and how the team, as a group, is pursuing them.
- Identifying critical milestones to be reached and the expected contribution from the team members.

P&S fosters team member communication and interfaces, clarifies assumptions about leadership, encourages competition, guides reward systems and enhances probabilities of success. Other team-related skills such as flexibility, patience, ability to check out as-

sumptions, willingness to listen to others, curiosity and versatility are encouraged by P&S among project team members. P&S educates project managers to trust the ability of effective teams to outperform individuals.

Planning and Scheduling Development

The key issue in selecting a P&S working package is simplicity. It must be kept in mind that for a P&S program to work, it must be clearly understood by all. If it is confusing, it will not be followed; and if it is not followed, people will not make the necessary effort to make it accurate, and consequently, it will become useless.

Reports must be kept short so anybody can read them, and graphics must be abundant so people bear in mind what is going on. Needless to say, accuracy should be consistent so that everybody in the project is guided by the P&S program. Different project forums should use different levels of detail. It would be a useless exercise to try to expose management to all schedule calculations. This belongs to the planning and scheduling engineers. By the same token, it would be ridiculous to think that engineers can manage all aspects of a job using a simple bar chart.

P&S Needs at Project Conceptual Stage. The main activity for P&S at project conceptual stage is identification of the scope of the job. (Table 4). It means that every input by the conceptual engineers must be translated

Table 4. Checklist for P&S Activity at the Conceptual Stage

- Gain total project management team commitment on the P&S program.
- Establish update periods, feedback deadlines, level of detail and distribution list.
- Decide on computer applications to use.
- Identify scope of work.
- Generate a work breakdown structure.
- Introduce first P&S program draft and clearly establish its expectations.

to activities to be planned and scheduled. Once all activities have been identified, the work breakdown structure must be established to keep the work systematically organized. Finally, a master milestone schedule must be developed to help the team visualize the total project.

P&S at Project Proposal Stage. Project proposal development brings more detail to the plans, and it should be inserted into the incipient P&S program (Table 5).

Table 5. Checklist for P&S Activity at the Project Proposal Stage

- Set up the OBS.
- Define the OBS and WBS interface.
- Generate project code of accounts.
- Create work packages.
- Introduce a project proposal progress measuring system.
- Develop the first network schedule and update it periodically according to new information generated by the project proposal progress.
- Resource load the plan and schedule and identify long lead time material and equipment.

An organization breakdown structure (OBS) should be set up to establish management responsibility. Then, by interfacing the OBS with the WBS, working packages are set up. A breakdown of the work packages into cost items will provide the basis to develop the schedule network that will guide the project. An improved P&S program will help develop a better understanding of the scope of the job and generate more accurate cost/time estimates. Long lead time material required for the project must be clearly identified and scheduled according to the network plan.

P&S During Definitive Design. When project expenditures have been approved and definitive design is awarded, all the P&S effort developed during the previous project life phases will start paying off. Having a well

identified and organized schedule network with the solid foundations of WBS, OBS and work packages, planning and scheduling the definitive design phase will not be a problem. Table 6 presents a checklist for P&S efforts during the design phase.

Table 6. Checklist for P&S Activity at the Design Stage

- Compare inhouse schedules against awarded contractor schedules and revise accordingly.
- Set up a reliable project progress measuring system based on the approved working schedule.
- Revise the company's cost and schedule estimates as the design progresses to show the detail is continuously introduced and its corresponding impact on the plan.
- Keep a vivid interest on project procurement requirements and their impact on the job.

The number of drawings per cost item can be forecasted and labor levels established and compared against bidders' offers. A definitive design contractor's working schedule can be reviewed and approved accordingly and a progress measuring system implemented. The project's overall P&S should be constantly revised according to authorized-for-construction-drawing production. Time and cost estimates are adjusted against the latest materials and other resources takeoff lists, and P&S will provide a clear organization for everybody to visualize project status. Special attention must be given to planning and scheduling requisitions and purchase orders for long lead time material and equipment at this stage.

P&S During Construction. This final phase of the project will receive most of the benefits of the early P&S program. At the bid job explanation meeting there will be an in-house generated schedule network to help bidders understand what they are about to enter. It is an excellent tool for getting competitive bids and thereby cost reductions.

The previously developed cost items and work packages will provide a solid structure for bidders' quotation costing and avoidance of dear mistakes. Table 7 shows a checklist for P&S development during construction.

Table 7. Checklist for P&S Activity at the Construction Stage

- Compare inhouse schedules against awarded contractor schedules and revise accordingly.
- Set up a reliable project progress measuring system based on the approved working schedule.
- Update schedule resources allocation to ascertain that it matches the scope of the job and definitive cost estimate.
- Establish a project change processing procedure with emphasis of the approval cycle duration.
- Institute performance indicators to be utilized and clarify their interpretation.
- Review and revise activities working crew sizes and their qualification requirements.
- Establish early warning systems for cost and schedule slippages.
- Establish a direct line of communication between cost estimating, scheduling, material procurement and surveying, and make all of them responsible for the project outcome.

When bidders submit their proposals, their construction schedules can be cross-checked against the company's previously developed schedule for accuracy and scope compliance.

Conclusion

Planning and scheduling programs are excellent management tools when properly introduced to the project management team and regularly maintained. Communications, creativity, flexibility and accuracy are substantially improved by following a simple set of rules. A planning and scheduling program will work for you if you believe in it, make others in your project team realize its benefits, and above all, make it an extension of your project cost control philosophy.

References

Clark, F. D., Lorenzoni, A. B., *Applied Cost Engineering*, Marcel Dekker, New York, 1978.

Manzanera, R., *Cost Engineering References*, Aramco. 1988, 1989.

Moder, J. J., and C. R. Phillips, *Project Management with CPM and PERT*, Van Nostrand Reinhold Co., New York, 1986.

O'Brien, J. J. and R. G. Zilly, *Contractor's Management Handbook*, McGraw-Hill, New York, 1971.